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L1: Entry 1 of 2

File: JPAB

Nov 5, 2002

PUB-NO: JP02002321509A
DOCUMENT-IDENTIFIER: JP 2002321509 A
TITLE: PNEUMATIC TIRE

PUBN-DATE: November 5, 2002

INVENTOR-INFORMATION:

NAME COUNTRY
OHASHI, TOSHIYUKI

ASSIGNEE-INFORMATION:

NAME COUNTRY
TOYO TIRE & RUBBER CO LTD

APPL-NO: JP2001131164
APPL-DATE: April 27, 2001

INT-CL (IPC): B60 C 11/12

ABSTRACT:

PROBLEM TO BE SOLVED: To provide a pneumatic tire that properly suppresses collapse of a block, while making the best use of an advantage of a wavy sipe, and offers a good braking performance and uneven wear resistance on an icy road surface reflecting a highly uniform road contacting pressure within the block.

SOLUTION: There is provided a pneumatic tire provided with a tread pattern having thereon a flat portion, in which at least one sipe 10 is formed. This tire is characterized in the following point. Namely, the sipe 10 is provided with a first wavy sipe portion S1 and a second wavy sipe portion S2. The first wavy sipe portion S1 is a train of protrusions and indentations formed on an inner wall surface 13 of the sipe that is tilted in relation to a normal direction of a flat portion tread surface 1a. The second wavy sipe portion S2 is a train of protrusions and indentations that is tilted in a direction opposite to the tilting direction of the train of protrusions and indentations of the first sipe portion S1. The two sipe portions are connected alternately to each other in a depth direction of the sipe.

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L1: Entry 2 of 2

File: DWPI

Mar 8, 2004

DERWENT-ACC-NO: 2003-260448

DERWENT-WEEK: 200418

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TITLE: Pneumatic tire for vehicles, has waveform inner wall face of sipe, consisting of intermediate portion inclined in opposite direction to upper and lower portions inclined with respect to normal line direction of tread

PATENT-ASSIGNEE:

ASSIGNEE	CODE
TOYO RUBBER IND CO LTD	TOYF

PRIORITY-DATA: 2001JP-0131164 (April 27, 2001)

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PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
<input type="checkbox"/> <u>JP 3504632 B2</u>	March 8, 2004		006	B60C011/12
<input type="checkbox"/> <u>JP 2002321509 A</u>	November 5, 2002		006	B60C011/12

APPLICATION-DATA:

PUB-NO	APPL-DATE	APPL-NO	DESCRIPTOR
JP 3504632B2	April 27, 2001	2001JP-0131164	
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JP2002321509A	April 27, 2001	2001JP-0131164	

INT-CL (IPC): B60 C 11/12

ABSTRACTED-PUB-NO: JP2002321509A

BASIC-ABSTRACT:

NOVELTY - The waveform inner wall face of sipe (10) provided on the convex block (1) of a tread, has intermediate portion (S2) inclined in opposite direction to the upper and lower portions (S1) inclined with respect to normal line direction of tread surface (1a). The boundary line between the intermediate, upper and lower portions is arranged in parallel with respect to convex block of tread.

USE - Pneumatic tire for vehicles.

ADVANTAGE - Prevents the falling of convex block of tire. Provides uniform bearing pressure within the block. Provides damping and abrasion properties in an ice road surface and thereby provides a favorable pneumatic tire.

DESCRIPTION OF DRAWING(S) - The figure shows the partially exploded perspective view of block of a tire.

Convex block 1

Tread surface 1a

Sipe 10

Upper and lower portions S1

Intermediate portion S2

CHOSEN-DRAWING: Dwg.2/5

TITLE-TERMS: PNEUMATIC VEHICLE WAVEFORM INNER WALL FACE SIPE CONSIST INTERMEDIATE PORTION INCLINE OPPOSED DIRECTION UPPER LOWER PORTION INCLINE RESPECT NORMAL LINE DIRECTION TREAD

DERWENT-CLASS: A95 Q11.

CPI-CODES: A12-T01B;

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(51)Int.Cl.⁷
B 60 C 11/12

識別記号

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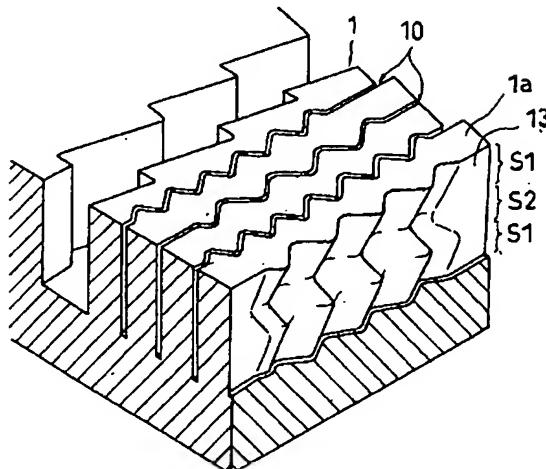
弁理士 鈴木 崇生 (外4名)

(54)【発明の名称】 空気入りタイヤ

(57)【要約】

【課題】 波型サイフの長所を生かしつつ、ブロックの倒れ込みを適度に抑制し、しかもブロック内の接地圧の均一性が高いため、アイス路面での制動性能や耐偏摩耗性能が良好な空気入りタイヤを提供する。

【解決手段】 少なくとも1本のサイフ10を形成した陸部を有するトレッドパターンを備えた空気入りタイヤにおいて、前記サイフ10は、陸部踏面1aの法線方向に対してサイフ内壁面13の凹凸列が傾斜した波状の第1サイフ部S1と、その第1サイフ部S1とはサイフ内壁面13の凹凸列が逆向きに傾斜した波状の第2サイフ部S2とが、サイフの深さ方向に交互に連設されていることを特徴とする。



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【特許請求の範囲】

【請求項1】少なくとも1本のサイフを形成した陸部を有するトレッドパターンを備えた空気入りタイヤにおいて、前記サイフは、陸部踏面の法線方向に対してサイフ内壁面の凹凸列が傾斜した波状の第1サイフ部と、その第1サイフ部とはサイフ内壁面の凹凸列が逆向きに傾斜した波状の第2サイフ部とが、サイフの深さ方向に交互に連設されていることを特徴とする空気入りタイヤ。

【請求項2】前記サイフは、前記第1サイフ部と前記第2サイフ部と前記第1サイフ部とが順次深さ方向に連設されると共に、前記第1サイフ部と前記第2サイフ部との境界線が前記陸部踏面に対して平行な面内に位置する請求項1記載の空気入りタイヤ。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、少なくとも1本のサイフを形成したブロック又はリブなどの陸部を有するトレッドパターンを備えた空気入りタイヤに関し、特にスタッドレスタイヤとして有用である。

【0002】

【従来の技術】従来より、スタッドレスタイヤのアイス性能を向上させる目的で、タイヤパターンの各部（センター部、メディエイト部、ショルダーパー）に複数のサイフを配置したものが知られている。かかるサイフの形状としては、サイフの深さ方向に形状が変化しない平面又は波型のサイフが従来は一般的であった。このようなサイフをブロックに形成することにより、エッジ効果、除水効果、及び凝着効果が向上するため、サイフの本数は近年増加する傾向にあった。

【0003】しかし、サイフの本数を増やしてサイフ密度を高めていくと、エッジ数は増えるものの、ブロック全体の剛性が低下してサイフが過度に倒れ込むことにより、逆にエッジ効果が小さくなり、アイス性能も低下するという問題が生じる。このため、サイフの形状を深さ方向で変化させて、サイフの倒れ込みを抑制した、いわゆる3次元サイフが近年注目されている。

【0004】これまで3次元サイフの形状としては、種々のものが提案されており、幾つかのタイプに分けることができるが、そのうちの1つとして波型サイフの振幅を深さによって変えたもの（特開昭59-193306号公報など）や、波型サイフの内壁面の凹凸列（丘陵）の方向を陸部踏面の法線方向から斜めに傾斜させたもの（特開平10-258615号公報）などが存在する。これらは何れも、ブロックとサイフが倒れ込む際に、斜め方向に延びたサイフ内壁面の凸条と凹条とが係合する作用により、倒れ込みを抑制するものである。

【0005】

【発明が解決しようとする課題】しかしながら、上記前者の公報に記載のサイフでは、凸条の方向を全体的に傾

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斜させにくいため係合作用が小さいという問題がある。また、上記後者の公報に記載のように、凹凸列が斜め方向に傾斜したサイフでは、ブロック内で接地圧が不均一となり、これよりアイス路面での制動性能や耐偏摩耗性能が十分改善できないという問題がある。つまり、図2(a)～(c)は、それぞれサイフの横断面、未接地状態の模式図、接地状態の模式図を示しているが、この図に示すように、一方の方向に凹凸列が傾いているサイフ30では、接地状態で垂直圧がかかる場合に、凹凸列に働く曲げモーメントが大きくなり、その際生じる変形によって、凸条31の鈍角部31aの接地圧が高く、鋭角部31bの接地圧が小さくなり、ブロック内で接地圧が不均一となる。また、凹条32についても対向する内壁面の凸条について同様のことが言える。

【0006】そこで、本発明の目的は、波型サイフの長所を生かしつつ、ブロックの倒れ込みを適度に抑制し、しかもブロック内の接地圧の均一性が高いため、アイス路面での制動性能や耐偏摩耗性能が良好な空気入りタイヤを提供することにある。

【0007】

【課題を解決するための手段】上記目的は、下記の如き本発明により達成できる。即ち、本発明の空気入りタイヤは、少なくとも1本のサイフを形成した陸部を有するトレッドパターンを備えた空気入りタイヤにおいて、前記サイフは、陸部踏面の法線方向に対してサイフ内壁面の凹凸列が傾斜した波状の第1サイフ部と、その第1サイフ部とはサイフ内壁面の凹凸列が逆向きに傾斜した波状の第2サイフ部とが、サイフの深さ方向に交互に連設されていることを特徴とする。

【0008】上記において、前記サイフは、前記第1サイフ部と前記第2サイフ部と前記第1サイフ部とが順次深さ方向に連設されると共に、前記第1サイフ部と前記第2サイフ部との境界線が前記陸部踏面に対して平行な面内に位置することが好ましい。

【0009】【作用効果】本発明によると、凹凸列が交互（くの字状又はジグザク状）に傾斜した波状のサイフが連設されているため、凹凸列の傾斜角度を大きくとることができ、ブロックの倒れ込み時のサイフ内壁面の凸条と凹条との係合作用を大きくすることができる。また、一方の方向にサイフの凹凸列が傾いている場合と比較して、ブロック内の接地圧の均一性を高めることができる。つまり、図3(a)～(c)は、それぞれサイフの横断面、未接地状態の模式図、接地状態の模式図を示しているが、この図に示すように、交互に凹凸列が傾いているサイフ10では、接地面付近の曲げ力が生じる長さが短くなるため、接地状態で垂直圧がかかる場合に、凹凸列に働く曲げモーメントが相対的に小さくなつて変形が生じにくくなり、凸条11の鈍角部11aの接地圧と鋭角部11bの接地圧が均一化されてブロック内で接地圧が均一化される。また、凹条12についても対

向する内壁面の凸条について同様のことが言える。その結果、波型サイフの長所を生かしつつ、ブロックの倒れ込みを適度に抑制し、しかもブロック内の接地圧の均一性が高いため、アイス路面での制動性能や耐偏摩耗性能が良好な空気入りタイヤを提供することができる。

【0010】前記サイフが、前記第1サイフ部と前記第2サイフ部と前記第1サイフ部とが順次深さ方向に連設されると共に、前記第1サイフ部と前記第2サイフ部との境界線が前記陸部踏面に対して平行な面内に位置する場合、上述の曲げ力が生じる長さが等しくなるため、ブロック内で接地圧がより均一化され、アイス路面での制動性能や耐偏摩耗性能をより改善することができる。また、サイフ部を3段構成とするのが好ましいのは、サイフの深さと凹凸列の振幅周期と傾斜角度との関係を好適化して、上記改善効果を高められるためである。

【0011】

【発明の実施の形態】以下、本発明の実施の形態について、図面を参照しながら説明する。本発明の空気入りタイヤは、図1に示すように、少なくとも1本のサイフ10を形成したブロック1などの陸部を有するトレッドパターンTを備える。本実施形態では、周方向溝2と横溝3、5と斜溝4により区分されたブロック1が形成され、タイヤ幅方向に6列のブロック1が配列されている例を示す。

【0012】各々のブロック1には、タイヤ幅方向に向けて複数列のサイフ10が形成されており、各々のサイフ10の両端は、ブロック1に隣接する溝に開口しているが、それに限定されるものではなく、ブロック1の側壁から露出せずにブロック1の側壁の内側に留めたり、片側のみを留めたりと、パターン構成によって適宜使い分けることができる。

【0013】図2は、本発明におけるブロックの要部を示す一部破断した斜視図である。この図2では、内壁面13の凹凸形状が分かり易いように、ブロック1の一部を破断してサイフ10の内壁面13を露出させている。

【0014】本発明におけるサイフ10は、図2に示すように、陸部踏面1aの法線方向に対してサイフ内壁面13の凹凸列が傾斜した波状の第1サイフ部S1と、その第1サイフ部S1とはサイフ内壁面13の凹凸列が逆向きに傾斜した波状の第2サイフ部S2とが、サイフの深さ方向に交互に連設されている。本実施形態では、第1サイフ部S1と第2サイフ部S2と第1サイフ部S1とが順次深さ方向に連設されると共に、第1サイフ部S1と第2サイフ部S2との境界線が陸部踏面1aに対して平行な面内に位置するサイフ10を設けた例を示す。

【0015】サイフ10の凹凸列に垂直な断面形状としては、正弦波に近いものに限られず、直線と曲線とを交互に組み合わせた波線、矩形波、ジグザグ状に近いもの等、何れの形状でもよい。この断面形状における凹凸の周期（例えば凸-凸頂部間の距離）は、いわゆる波型サ

イフの特性を好適に発現する上で1.5~5mmが好ましく、振幅（両側頂部の高さの和）は1.5~5mmが好ましい。

【0016】第1サイフ部S1と第2サイフ部S2との凹凸の周期と振幅は、同一でも異なっていてもよいが、両者の周期と振幅が同一であることが好ましい。また、第1サイフ部S1と第2サイフ部S2との周期や振幅を変える場合には、両者の境界部が連続するように、周期や振幅を調整するのが好ましい。これにより、波状の境界線によって両者をスムーズに連設することができ、第1サイフ部S1の凹凸列の傾斜方向と第2サイフ部S2との傾斜方向とを、陸部踏面1aの法線方向に対して非対称とすることができます。

【0017】次に、各部のサイズ等について説明する。本発明における第1サイフ部S1又は第2サイフ部S2の各々の法線方向の幅は、1.5~3mmが好ましい。また、サイフ10の全体の深さは、主溝深さの40~80%、即ち4~8mmが好ましい。従って、第1サイフ部S1と第2サイフ部S2との連設段数は、2~4段が好ましく、3段がより好ましい。

【0018】また、第1サイフ部S1又は第2サイフ部S2の各々の法線方向に対する傾斜角度は、30~70°が好ましく、45°が最も好ましい。30°より小さいと、ブロックの倒れ込み時のサイフ内壁面13の凸条と凹条との係合作用が小さくなる傾向があり、70°より大きいと、相対的に接地面付近の曲げ力が生じる長さが大きくなり、ブロック内で接地圧が不均一化しやすい傾向がある。

【0019】サイフ10の溝幅は、ブロックの倒れ込みを適度に抑制しながら、エッジ効果を好適に発現する上で、0.2~0.7mmが好ましく、0.2~0.4mmがより好ましい。

【0020】本発明では、第2サイフ部S2によるブロック1の倒れ込み抑制効果が大きいため、サイフ10の本数を増やしてサイフ密度を高めることで、エッジ数を増やしてエッジ効果を更に高めることができる。このような観点から本発明では、サイフ密度0.1~0.3mm/m²が好ましく、0.15~0.25mm/mm²がより好ましい。

【0021】サイフ10は通常、1つのブロック1に対して複数形成されるが、隣接するサイフ10同士は、同一形状でも異なる波形状、傾斜角度、凹凸の周期、振幅であってもよい。但し、加硫成型後の脱型性を良好にするうえで、隣接するサイフ10同士が同一形状であることが、好ましい。

【0022】本発明の空気入りタイヤは、上記の如きトレッドパターンTを備える以外は、通常の空気入りタイヤと同等であり、従来公知の材料、形状、構造、製法などが何れも本発明に採用できる。

【0023】本発明の空気入りタイヤは、前述の如き作

用効果を奏し、アイス性能に優れるため、特にスタッダレスタイヤとして有用である。

【0024】【他の実施形態】以下、本発明の他の実施の形態について説明する。

【0025】(1) 前述の実施形態では、第1サイフ部と第2サイフ部と第1サイフ部とが順次深さ方向に連設される例を示したが、本発明では第1サイフ部と第2サイフ部とが、サイフの深さ方向に交互に連設されている部分を有していればよく、例えば図4(a)～(c)に示すようなサイフ形状でもよい。この図では、サイフの凹凸列のうち紙面の裏側に突出する凸条を11、紙面の表側に突出する凸条を12として模式的に表示している。

【0026】図4(a)に示すものは、第1サイフ部S1と第2サイフ部S2とが連設され、その踏面側に更に陸部踏面の法線方向に凹凸列が延びる第3サイフ部S3が連設された例である。このサイフの場合にも、第1サイフ部S1と第2サイフ部S2によって、ブロックの倒れ込み時のサイフ内壁面の凸条と凹条との係合作用を得ることができる。また、第3サイフ部S3の存在は、第2サイフ部S2に働く曲げ長さを大きくしないため、前述の実施形態の場合と同様にブロック内の接地圧の均一性を高めることができる。

【0027】図4(b)に示すものは、第1サイフ部S1と第2サイフ部S2との連設段数を4段にした例である。このサイフの場合、3段構成の場合と比較して、更にブロック内の接地圧の均一性を高めることができる。

【0028】図4(c)に示すものは、第1サイフ部S1と第2サイフ部S2とを直接連設する代わりに、短い第4サイフ部S4を介在させて第1サイフ部S1と第2サイフ部S2とを連設させた例である。第4サイフ部S4としては、陸部踏面の法線方向に凹凸列が延びる波状サイフや、第1サイフ部S1と第2サイフ部S2とを曲面で連続させる形状でもよい。このような第4サイフ部S4を介在させることにより、ブロックの倒れ込みの抑制効果と、ブロック内の接地圧の均一性をある程度維持しながら、加硫成型後の脱型性を向上させることができる。

【0029】(2) 前述の実施形態では、トレッドパターン内の全てのサイフに対して、本発明における内壁面の凹凸列がジグザク状に傾斜したサイフを適用する例を示したが、同一ブロック内の一部のサイフにだけ適用してもよく、また、複数のブロックのうちの一部のブロック等の陸部にだけ適用してもよい。一部のブロックのみに本発明におけるサイフを適用する場合、特にタイヤのショルダー部に設けられたブロックに適用するのが有効である。

【0030】(3) 前述の実施形態では、図1に示すようなブロックパターンの例を示したが、この形状のブロックに限らず、平行四辺形、V字型、5角形、又は曲線

基調のブロックでもよい。また、中央付近や端部近傍まで溝の入ったブロックや一部の陸部が周方向に連続するもの、又はリップ基調のパターンでもよい。

【0031】(4) 前述の実施形態では、図1に示すように、タイヤ幅方向に向けて複数列のサイフが形成された例を示したが、サイフの形成方向(中央線の方向)は、タイヤ幅方向と平行に限られるものではない。但し、中央線の方向とタイヤ幅方向とがなす角度は0～45°が好ましい。

【0032】(5) 前述の実施形態では、図2に示すように、サイフがブロック表面に対して垂直になるように形成された例を示したが、ブロック表面の法線に対してサイフの基準面が若干(例えば15°以下)傾斜してもよい。また、サイフの基準面が第1サイフ部と第2サイフ部とで異なる角度で傾斜していてもよい。

【0033】

【実施例】以下、本発明の構成と効果を具体的に示す実施例等について説明する。なお、タイヤの各性能評価は、次のようにして行った。

【0034】(1) アイス制動性能

タイヤを実車(国産2000ccクラスのFFセダン)に装着し、1名乗車の荷重条件にて、凍結した路面を走行させ、速度40km/hで制動力をかけてフルロックした際の制動距離を指数で評価した。なお、評価は従来品(比較例1)を100としたときの指標表示で示し、数値が大きいほど良好な結果を示す。

【0035】(2) 耐摩耗性能

舗装道路を8000km走行したときの段差摩耗量(摩耗によるサイフとサイフとの段差)を測定し、指数で評価した。なお、評価は従来品(比較例1)を100としたときの指標表示で示し、数値が大きいほど良好な結果を示す。

【0036】実施例1

図1に示すようなトレッドパターンにおいて、図2のような形状のサイフを下記のサイズにてブロック全面に形成してサイズ185/70R14のラジアルタイヤを製造した。このタイヤを用いて、上記の各性能評価を行った結果を表1に示す。

【0037】サイフ全体の深さを6.9mm、溝幅を0.3mm、上下の第1サイフ部の振幅1.5mm、周期4.0mm、法線方向の幅2.3mm、傾斜角度45°、第2サイフ部の振幅1.5mm、周期4.0mm、法線方向の幅2.3mm、傾斜角度45°とした。

【0038】比較例1(従来品)

従来の波型サイフにおいて、第1サイフ部と同じ形状・サイズで傾斜角度0°としたこと以外は、実施例1と同様にして、サイズ185/70R14のラジアルタイヤを製造し、上記の各性能評価を行った。その結果を表1に示す。

【0039】比較例2

実施例1において、第2サイフ部を設けずに第1サイフ部のみで、同じ形状、サイズ、傾斜角度でサイフ全体を形成すること以外は、実施例1と同様にして、サイズ185/70R14のラジアルタイヤを製造し、上記の各性能評価を行った。その結果を表1に示す。

【0040】

【表1】

	比較例1	実施例1	比較例2
サイフ建設方向	垂直	ジグザグ	傾斜
アイス制動性能	100	106	102
耐摩耗性能	100	106	101

表1の結果が示すように、実施例ではブロックの倒れ込みの適度な抑制効果とブロック内の接地圧の均一化により、アイス制動性能、及び耐摩耗性能が従来品より良好であった。これに対して、サイフ建設方向が一向方に傾斜した比較例2では、ブロック内の接地圧の不均一化のため、アイス制動性能と耐摩耗性能の改善効果が小さか

った。

【図面の簡単な説明】

【図1】本発明の空気入りタイヤの一例のトレッド面を示す平面図

【図2】本発明におけるブロックの要部を示す一部破断した斜視図

【図3】本発明におけるサイフの模式図であり、(a)はサイフの横断面、(b)は未接地状態の模式図、(c)は接地状態の模式図

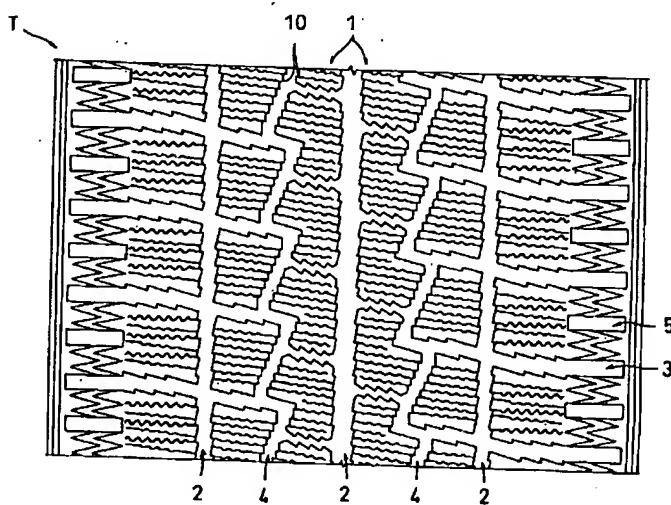
【図4】本発明におけるサイフの他の例を示す模式図

【図5】従来のサイフの例を示す模式図

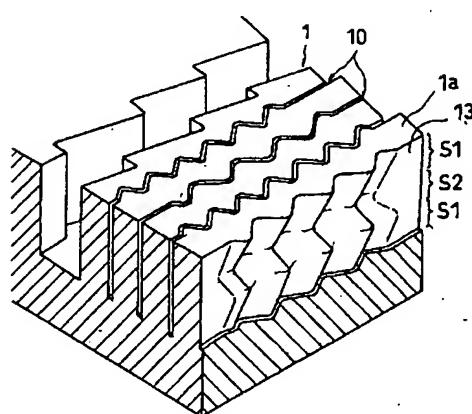
【符号の説明】

- 1 ブロック
- 1a 陸部踏面
- 10 サイフ
- S1 第1サイフ部
- S2 第2サイフ部
- 13 サイフ内壁面
- T トレッドパターン

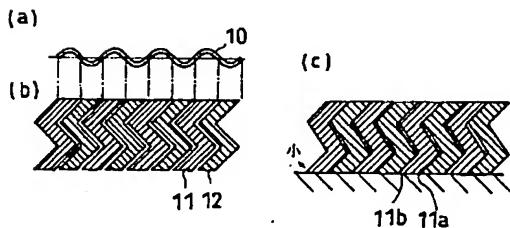
【図1】



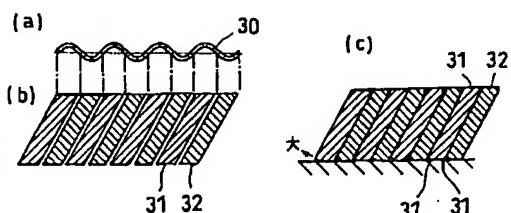
【図2】



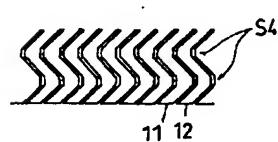
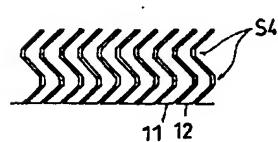
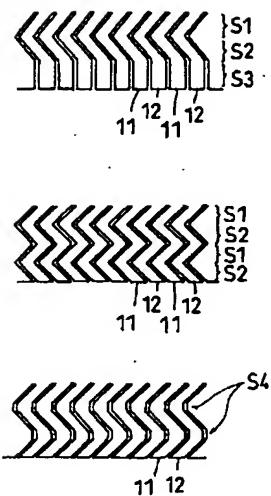
【図3】



【図5】



【図4】



*** NOTICES ***

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1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]**[0001]**

[Field of the Invention] This invention is useful especially as a studless tire about the pneumatic tire equipped with the tread pattern which has land parts, such as a block in which at least one SAIPU was formed, or a rib.

[0002]

[Description of the Prior Art] What has arranged two or more SAIPU conventionally for the purpose which raises the ice engine performance of a studless tire to each part (the pin center, large section, MEDI eight section, shoulder section) of a tire pattern is known. As a configuration of this SAIPU, SAIPU of the flat surface where a configuration does not change in the depth direction of SAIPU, or a wave type was conventionally common. Since an edge effect, the dewatering effectiveness, and the adhesion effectiveness improved by forming such SAIPU in a block, the number of SAIPU suited the inclination which increases in recent years.

[0003] However, if the number of SAIPU is increased and the SAIPU consistency is raised, although the number of edges will increase, when the rigidity of the whole block falls and SAIPU falls too much, an edge effect becomes small conversely and the problem that the ice engine performance also falls arises. For this reason, the configuration of SAIPU is changed in the depth direction and the so-called three-dimension SAIPU which controlled the fall lump of SAIPU attracts attention in recent years.

[0004] Although various things are proposed as a configuration of three-dimension SAIPU until now and it can divide into some types, the things (JP,59-193306,A etc.) which changed the amplitude of wave type SAIPU with the depth as one of them, the thing (JP,10-258615,A) which made the direction of the concavo-convex train (hill) of the internal surface of wave type SAIPU incline aslant from [of a land part tread] a normal exist. Each of these controls a fall lump according to the operation with which the protruding line and concave streak of the SAIPU internal surface prolonged in the direction of slant engage, in case a block and SAIPU fall.

[0005]

[Problem(s) to be Solved by the Invention] However, in SAIPU given in the official report of the above-mentioned former, since it is hard to make the direction of a protruding line incline on the whole, there is a problem that an engagement operation is small. Moreover, like a publication in the official report of the above-mentioned latter, by SAIPU toward which the concavo-convex train inclined in the direction of slant, ground pressure becomes uneven within a block and there is a problem that the braking engine performance or partial-wear-proof ability in an ice road surface cannot improve enough from this. That is, although drawing 5 (a) - (c) shows the cross section of SAIPU, the mimetic diagram in the condition of not grounding, and the mimetic diagram of a touch-down condition, respectively As shown in this drawing, in SAIPU 30 by which the concavo-convex train leans only to the one direction When perpendicular ** starts in the state of touch-down, the bending moment committed in a concavo-convex train becomes large, according to the deformation produced in that case, the ground pressure of obtuse angle section 31a of a protruding line 31 is high, the ground pressure of acute-angle section 31b

becomes small, and ground pressure serves as an ununiformity within a block. Moreover, it can say that it is the same about the protruding line of the internal surface which counters also about a concave streak 32.

[0006] Then, employing the advantage of wave type SAIPU efficiently, the purpose of this invention controls a fall lump of a block moderately, and moreover, since the homogeneity of the ground pressure within a block is high, it is for the braking engine performance and partial-wear-proof ability in an ice road surface to offer a good pneumatic tire.

[0007]

[Means for Solving the Problem] This invention like the following can attain the above-mentioned purpose. In the pneumatic tire equipped with the tread pattern which has the land part in which the pneumatic tire of this invention formed at least one SAIPU namely, said SAIPU The 1st SAIPU section and its 1st SAIPU section of the shape of a wave toward which the concavo-convex train of a SAIPU internal surface inclined to the direction of a normal of a land part tread are characterized by forming successively by turns the 2nd SAIPU sections of the shape of a wave toward which the concavo-convex train of a SAIPU internal surface inclined in the reverse sense in the depth direction of SAIPU.

[0008] In the above, as for said SAIPU, it is desirable that the boundary line of said 1st SAIPU section and said 2nd SAIPU section is located in an parallel field to said land part tread while said 1st SAIPU sections, said 2nd SAIPU sections, and said 1st SAIPU sections are formed successively in the depth direction one by one.

[0009] Since SAIPU of the shape of a wave toward which the concavo-convex train inclined by turns (the shape of the shape of a character and JIGUZAKU of **) is formed successively according to [operation effectiveness] this invention, whenever [tilt-angle / of a concavo-convex train / large] can be taken, a block falls, and an engagement operation with the protruding line of the SAIPU internal surface at the time of a lump and a concave streak can be enlarged. Moreover, as compared with the case where the concavo-convex train of SAIPU leans, the homogeneity of the ground pressure within a block can be raised only to an one direction. That is, although drawing 3 (a) - (c) shows the cross section of SAIPU, the mimetic diagram in the condition of not grounding, and the mimetic diagram of a touch-down condition, respectively As shown in this drawing, in SAIPU 10 to which the concavo-convex train leans by turns Since the die length which the bending force near a ground plane produces becomes short, when perpendicular ** starts in the state of touch-down The bending moment committed in a concavo-convex train becomes small relatively, it is hard coming to generate deformation, the ground pressure of obtuse angle section 11a of a protruding line 11 and the ground pressure of acute-angle section 11b are equalized, and ground pressure is equalized within a block. Moreover, it can say that it is the same about the protruding line of the internal surface which counters also about a concave streak 12. Consequently, employing the advantage of wave type SAIPU efficiently, a fall lump of a block is controlled moderately, and moreover, since the homogeneity of the ground pressure within a block is high, the braking engine performance and partial-wear-proof ability in an ice road surface can offer a good pneumatic tire.

[0010] While said 1st SAIPU sections, said 2nd SAIPU sections, and said 1st SAIPU sections are formed successively in the depth direction one by one, said SAIPU Since the die length which the above-mentioned bending force produces becomes equal when the boundary line of said 1st SAIPU section and said 2nd SAIPU section is located in an parallel field to said land part tread, ground pressure is equalized more within a block and the braking engine performance and partial-wear-proof ability in an ice road surface can be improved more. Moreover, the thing with desirable considering the SAIPU section as a three-step configuration is because relation of whenever [depth / of SAIPU /, amplitude period / of a concavo-convex train /, and tilt-angle] is made suitable and the above-mentioned improvement effect is heightened.

[0011]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained, referring to a drawing. The pneumatic tire of this invention is equipped with the tread pattern T which has land parts, such as the block 1 in which at least one SAIPU 10 was formed, as shown in drawing 1.

With this operation gestalt, the block 1 classified by the hoop direction slot 2, transverse grooves 3 and 5, and the diagonal groove 4 is formed, and the example in which the block 1 of six trains is arranged crosswise [tire] is shown.

[0012] SAIPU 10 of two or more trains is formed in each block 1 towards the tire cross direction, and although opening of the both ends of each SAIPU 10 is carried out to the slot which adjoins block 1, they are not limited to it and can be properly used suitably by the pattern configuration as it is as stopping only one side **** [, and]. [stopping inside the side attachment wall of block 1, without exposing from the side attachment wall of block 1]

[0013] Drawing 2 is the perspective view showing the important section of the block in this invention fractured in part. In this drawing 2 , the shape of toothing of an internal surface 13 fractures a part of block 1, and is exposing the internal surface 13 of SAIPU 10 so that intelligibly.

[0014] As SAIPU 10 in this invention is shown in drawing 2 , as for the 1st SAIPU section S1 and its 1st SAIPU section S1 of the shape of a wave toward which the concavo-convex train of the SAIPU internal surface 13 inclined to the direction of a normal of land part tread 1a, the 2nd SAIPU sections S2 of the shape of a wave toward which the concavo-convex train of the SAIPU internal surface 13 inclined in the reverse sense are formed successively by turns in the depth direction of SAIPU. With this operation gestalt, while the 1st SAIPU section S1, the 2nd SAIPU section S2, and the 1st SAIPU sections S1 are formed successively in the depth direction one by one, the example which formed SAIPU 10 to which the boundary line of the 1st SAIPU section S1 and the 2nd SAIPU section S2 is located in an parallel field to land part tread 1a is shown.

[0015] Which configuration is sufficient as a thing near the wavy line which was not restricted to the thing near a sine wave as a cross-section configuration perpendicular to the concavo-convex train of SAIPU 10, but combined the straight line and the curve by turns, a square wave, and in the shape of zigzag etc. The period (for example, distance between convex-convex crownings) of the irregularity in this cross-section configuration has 1.5-5 desirablemm, when discovering the so-called property of wave type SAIPU suitably, and 1.5-5mm of amplitude (sum of the height of a both-sides crowning) is [a period] desirable.

[0016] Although the concavo-convex period and concavo-convex amplitude of the 1st SAIPU section S1 and the 2nd SAIPU section S2 may differ from each other even if they are the same, it is desirable that both period and amplitude are the same. Moreover, when changing the period and amplitude of the 1st SAIPU section S1 and the 2nd SAIPU section S2, it is desirable to adjust a period and the amplitude so that both boundary section may continue. Thereby, according to a wave-like boundary line, both can be formed successively smoothly and the inclination direction of the inclination direction of the concavo-convex train of the 1st SAIPU section S1 and the 2nd SAIPU section S2 can be made unsymmetrical to the direction of a normal of land part tread 1a..

[0017] Next, the size of each part etc. is explained. The width of face of each direction of a normal of the 1st SAIPU section S1 in this invention or the 2nd SAIPU section S2 has 1.5-3 desirablemm. Moreover, 40 - 80% of the major groove depth of the depth of whole SAIPU 10, i.e., 4-8mm, is desirable. Therefore, the successive formation number of stages of the 1st SAIPU section S1 and the 2nd SAIPU section S2 has 2-4 desirable steps, and its three steps are more desirable.

[0018] Moreover, whenever [to each direction of a normal of the 1st SAIPU section S1 or the 2nd SAIPU section S2 / tilt-angle] has desirable 30-70 degrees, and its 45 degrees are the most desirable. When smaller than 30 degrees, there is an inclination of a block to fall and for an engagement operation with the protruding line of the SAIPU internal surface 13 at the time of a lump and a concave streak to become small, when larger than 70 degrees, the die length which the bending force near a ground plane produces relatively becomes large, and there is an inclination which ground pressure tends to ununiformity-ize within a block.

[0019] When discovering an edge effect suitably, controlling a fall lump of a block moderately, the flute width of SAIPU 10 has 0.2-0.7 desirablemm, and its 0.2-0.4mm is more desirable.

[0020] In this invention, the block 1 by the 2nd SAIPU section 12 falls, since lump depressor effect is large, by increasing the number of SAIPU 10 and raising a SAIPU consistency, the number of edges can

be increased and an edge effect can be heightened further. At such a viewpoint to this invention, it is 2 the SAIPU consistency of 0.1-0.3mm/mm. It is desirable and is 2 0.15-0.25mm/mm. It is more desirable.

[0021] SAIPU 10 may usually be a concavo-convex period and the amplitude whenever [shape of wave from which SAIPU 10 adjoining comrades differ also in same configuration, and tilt-angle], although two or more formation is carried out to one block 1. However, when making unmolding nature after vulcanization molding good, it is desirable that SAIPU 10 adjoining comrades are the same configurations.

[0022] Except having the tread pattern T like the above, the pneumatic tire of this invention is equivalent to the usual pneumatic tire, and each of a well-known ingredient, configurations, structures, processes, etc. can adopt it as this invention conventionally.

[0023] Since the pneumatic tire of this invention does so the operation effectiveness like the above-mentioned and is excellent in the ice engine performance, it is useful especially as a studless tire.

[0024] Operation gestalt] which is others [] The gestalt of other operations of this invention is explained hereafter.

[0025] (1) Although the above-mentioned operation gestalt showed the example in which the 1st SAIPU section, the 2nd SAIPU section, and the 1st SAIPU sections are formed successively in the depth direction one by one, in this invention, a SAIPU configuration as shown in drawing 4 (a) - (c) is [that what is necessary is just to have the part currently formed successively by turns in the depth direction of SAIPU] sufficient as the 1st SAIPU section and the 2nd SAIPU section. In this drawing, the protruding line which projects the protruding line which projects on the background of space among the concavo-convex trains of SAIPU on the side front of 11 and space is typically displayed as 12.

[0026] What is shown in drawing 4 (a) is the example by which the 1st SAIPU section S1 and the 2nd SAIPU sections S2 were formed successively, and the 3rd SAIPU sections S3 to which a concavo-convex train extends in the direction of a normal of a land part tread further in the tread side were formed successively. Also in this SAIPU, by the 1st SAIPU section S1 and the 2nd SAIPU section S2, a block falls and an engagement operation with the protruding line of the SAIPU internal surface at the time of a lump and a concave streak can be acquired. Moreover, since existence of the 3rd SAIPU section S3 does not enlarge bending die length committed in the 2nd SAIPU section S2, it can raise the homogeneity of the ground pressure within a block like the case of the above-mentioned operation gestalt.

[0027] What is shown in drawing 4 (b) is the example which made four steps the successive formation number of stages of the 1st SAIPU section S1 and the 2nd SAIPU section S2. In this SAIPU, as compared with the case of a three-step configuration, the homogeneity of the ground pressure within a block can be raised further.

[0028] What is shown in drawing 4 (c) is the example which made short 4th SAIPU section S4 intervene, and made the 1st SAIPU section S1 and the 2nd SAIPU sections S2 form successively instead of forming successively the 1st SAIPU section S1 and the 2nd SAIPU sections S2 directly. The configuration which makes wavelike SAIPU to which a concavo-convex train extends, and the 1st SAIPU section S1 and the 2nd SAIPU section S2 continue in the direction of a normal of a land part tread as 4th SAIPU section S4 on a curved surface is sufficient. The unmolding nature after vulcanization molding can be raised maintaining the homogeneity of the depressor effect of a lump [fall] of a block, and the ground pressure within a block to some extent by making such 4th SAIPU section S4 intervene.

[0029] (2) Although the above-mentioned operation gestalt showed the example which applies SAIPU toward which the concavo-convex train of the internal surface in this invention inclined in the shape of JIGUZAKU to all SAIPU in a tread pattern, you may apply only to a part of SAIPU within the same block, and may apply only to land parts, such as a block of the part of two or more blocks. When applying SAIPU in this invention only to a part of blocks, it is effective to apply to the block formed especially in the shoulder section of a tire.

[0030] (3) Although the above-mentioned operation gestalt showed the example of a block pattern as

shown in drawing 1, the block of not only the block of this configuration but the parallelogram, a V-character mold, five square-shapes, or the curvilinear keynote may be used. Moreover, the pattern of the thing which follows a hoop direction, or the rib keynote is sufficient as the block into which the slot went near a center and to near the edge, or some land parts.

[0031] (4) Although the above-mentioned operation gestalt showed the example in which SAIPU of two or more trains was formed towards the tire cross direction as shown in drawing 1, the formation direction (the direction of Chuo Line) of SAIPU is not restricted to the tire cross direction and parallel. However, the include angle which the direction and the tire cross direction in Chuo Line make has desirable 0-45 degrees.

[0032] (5) Although the above-mentioned operation gestalt showed the example formed so that SAIPU might become perpendicular to a block front face as shown in drawing 2, the datum level of SAIPU may incline a little (for example, 15 degrees or less) to the normal on the front face of a block. Moreover, the datum level of SAIPU may incline at the include angle in which the 1st SAIPU section differs from the 2nd SAIPU section.

[0033]

[Example] Hereafter, the example which shows the configuration and effectiveness of this invention concretely is explained. In addition, each performance evaluation of a tire was performed as follows.

[0034] (1) Equipped the real vehicle (FF Sedan of 2000 cc class of domestic) with the ice braking engine-performance tire, it was made to run the road surface frozen in the loading condition of one-person entrainment, and the characteristic estimated the brake stopping distance at the time of carrying out a full lock by 40km/h in rate, having applied damping force. In addition, evaluation shows elegance (example 1 of a comparison) by the characteristic display when being referred to as 100 conventionally, and shows such a good result that a numeric value is large.

[0035] (2) The level difference abrasion loss (level difference of SAIPU and SAIPU by wear) when running wear-resistant ability pavement 8000km was measured, and the characteristic estimated. In addition, evaluation shows elegance (example 1 of a comparison) by the characteristic display when being referred to as 100 conventionally, and shows such a good result that a numeric value is large.

[0036] In the tread pattern as shown in example 1 drawing 1, SAIPU of a configuration like drawing 2 was formed all over the block in the following size, and size 185 / radial-ply tire of 70R14 was manufactured. The result of having performed each above-mentioned performance evaluation is shown in Table 1 using this tire.

[0037] The depth of whole SAIPU was made to 6.9mm, and the flute width was made [whenever / amplitude / of 0.3mm and the up-and-down 1st SAIPU section / of 1.5mm /, period / of 4.0mm /, width-of-face / of the direction of a normal / of 2.3mm /, and tilt-angle] into 45 degrees whenever [amplitude / of 45 degrees and the 2nd SAIPU section / of 1.5mm /, period / of 4.0mm /, width-of-face / of the direction of a normal / of 2.3mm, and tilt-angle].

[0038] The example 1 (conventional article) of a comparison

In conventional wave type SAIPU, like the example 1, size 185 / radial-ply tire of 70R14 was manufactured, and each above-mentioned performance evaluation was performed except 0 degree having cost whenever [tilt-angle] in the same configuration and size as the 1st SAIPU section. The result is shown in Table 1.

[0039] In example of comparison 2 example 1, without preparing the 2nd SAIPU section, like the example 1, size 185 / radial-ply tire of 70R14 was manufactured, and each above-mentioned performance evaluation was performed only in the 1st SAIPU section except forming whole SAIPU by whenever [same configuration, size, and tilt-angle]. The result is shown in Table 1.

[0040]

[Table 1]

	比較例 1	実施例 1	比較例 2
サイブ連設方向	垂直	ジグザグ	傾斜
アイス制動性能	100	106	102
耐摩耗性能	100	106	101

As the result of Table 1 showed, the ice braking engine performance and wear-resistant ability were conventionally better than elegance by equalization of the ground pressure within the moderate depressor effect of a lump [fall] of a block in the example, and a block. On the other hand, in the example 2 of a comparison toward which the SAIPU successive formation direction inclined in the one direction, the improvement effect of the ice braking engine performance and wear-resistant ability was small because of ununiformity-izing of the ground pressure within a block.

[Translation done.]

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1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

CLAIMS

[Claim(s)]

[Claim 1] In the pneumatic tire equipped with the tread pattern which has the land part in which at least one SAIPU was formed said SAIPU The 1st SAIPU section and its 1st SAIPU section of the shape of a wave toward which the concavo-convex train of a SAIPU internal surface inclined to the direction of a normal of a land part tread are a pneumatic tire with which the 2nd SAIPU section of the shape of a wave toward which the concavo-convex train of a SAIPU internal surface inclined in the reverse sense is characterized by being formed successively by turns in the depth direction of SAIPU.

[Claim 2] Said SAIPU is a pneumatic tire according to claim 1 with which the boundary line of said 1st SAIPU section and said 2nd SAIPU section is located in an parallel field to said land part tread while said 1st SAIPU sections, said 2nd SAIPU sections, and said 1st SAIPU sections are formed successively in the depth direction one by one.

[Translation done.]